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(56) Documents cited

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GB 1476332	US 4256009	US 3540343
GB 1139468		

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G4F

(51) INT CL³
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15/00 A47G 33/08 A63B 65/00 B42D 15/02 F23Q
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H04B 1/03 H04R 1/02

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A3B 10D
A3H 8
A3V 5D
A6D 4
A6S 11C7 26E5C
B6A 315 316 DE
B6G K
E1G 43 44A
F4F FX
G2J 6
G3T AAA QB
G4A DT
G4F 14
G5C JE
G5J ASS
G5R CG
H1N 628 AX
H3Q ACX
H4J 30F 30H AA

(54) Sound responsive lighting system and devices incorporating same

(57) A sound responsive lighting system comprises at least one light source 4, and control means 3 coupled to control the energization of the light source in accordance with the sound detected by a sound transducer 2. Control 3 may be responsive to the amplitude and/or frequency of the sound and may energise the lights 4 via a delay 6. The lights 4 are preferably LED's. The detected sound may be processed to generate pulser which, via a counter and decoder, cause sequential activation of lights in an array. The sequence stepping rate may increase with increase in sound level.

The lighting system may be incorporated in a plate for a switch, timepieces, key-ring togs, lighters, jewellery, items of clothing, Christmas and other decorations, record or cassette players, radios, loudspeakers, cameras, calculators, musical boxes and instruments, a musical mobile, kaleidoscopes, throwing balls, discs, boomerangs and other toys, gramophone record covers, picture story books, greetings cards and pet collars.

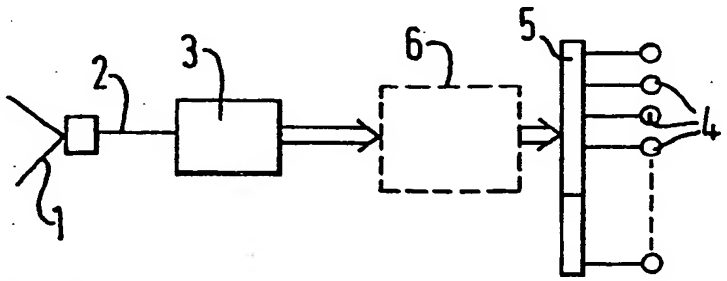

FIG. 1.

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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

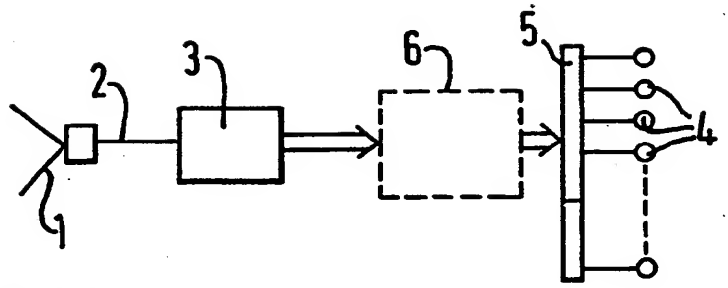


FIG. 1.

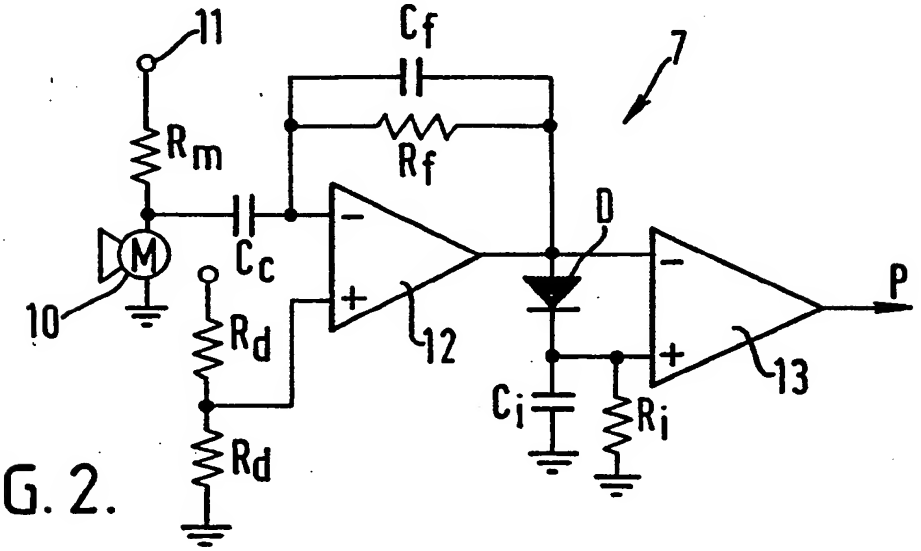


FIG. 2.

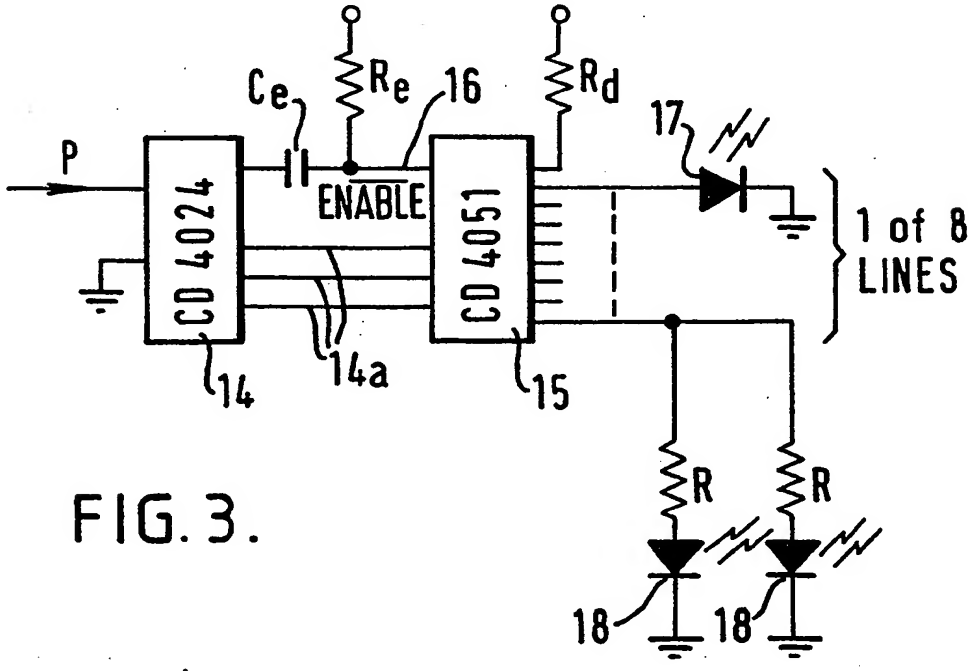


FIG. 3.

FIG. 4.

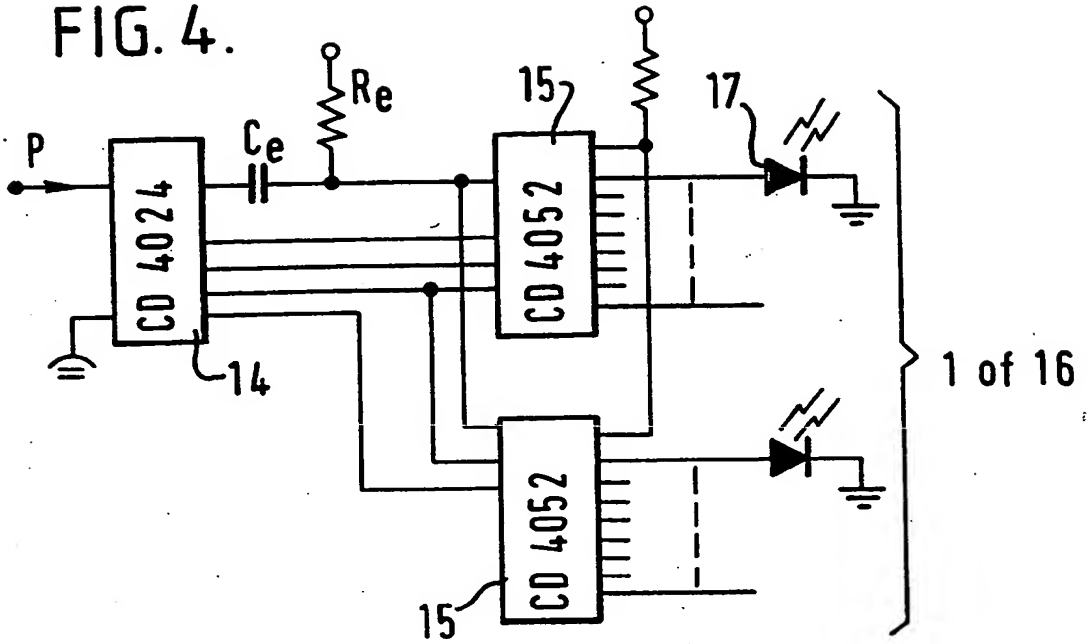


FIG. 5.

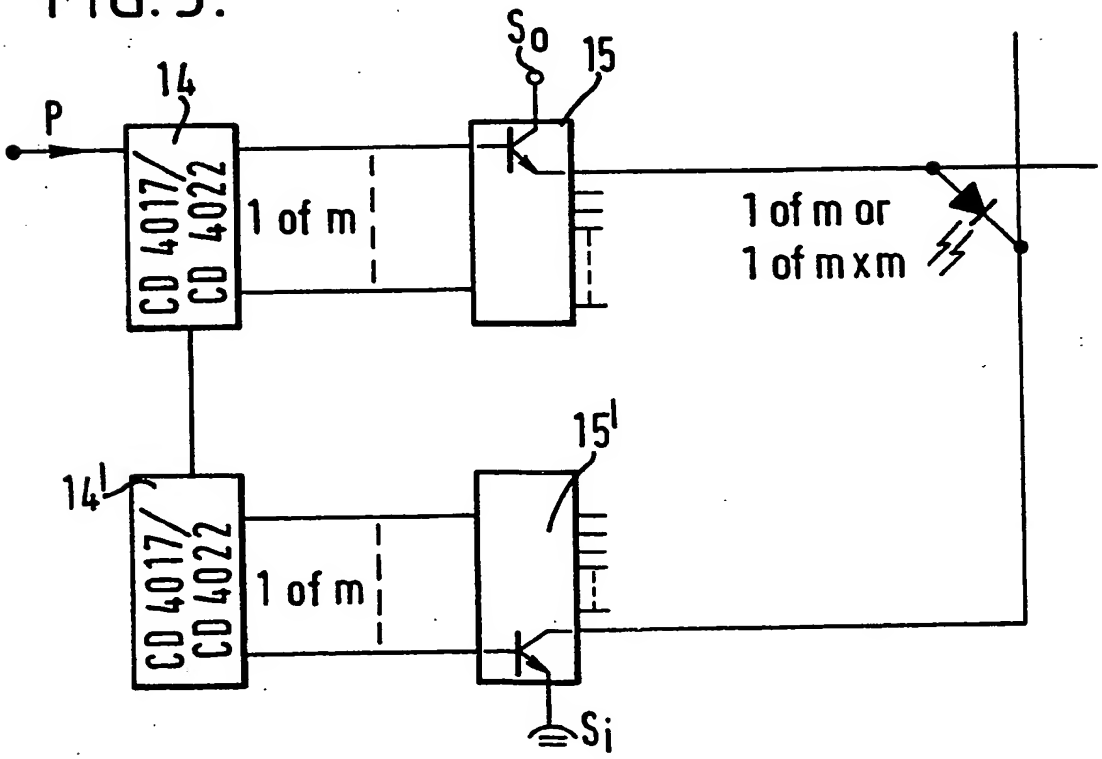
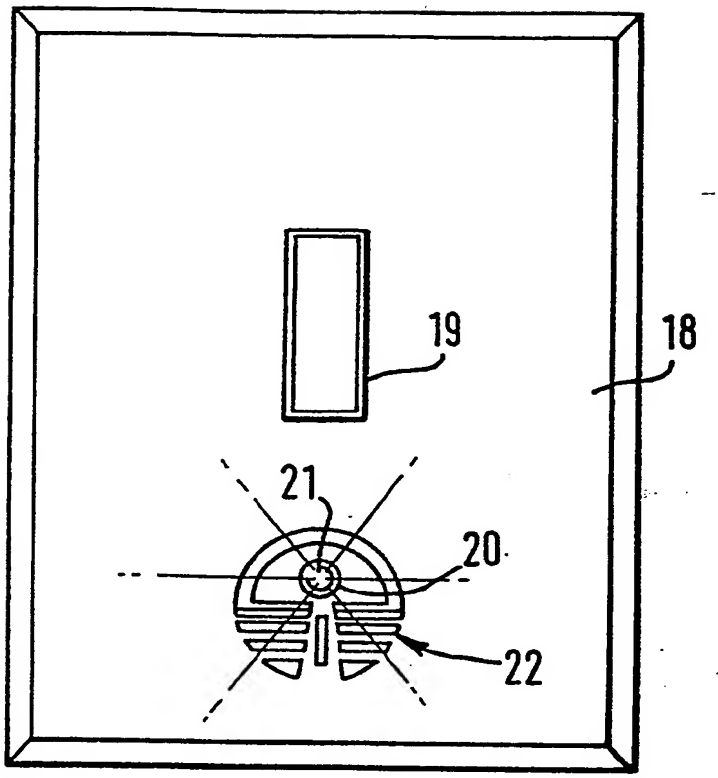


FIG. 6.



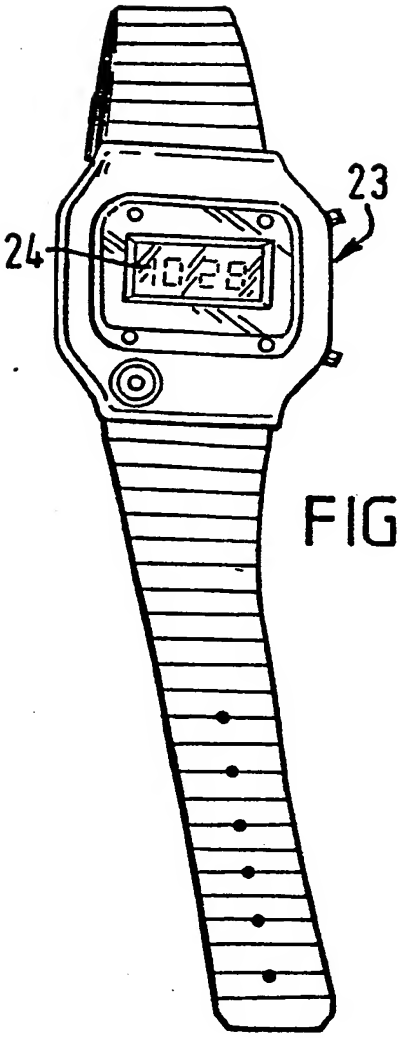


FIG. 7

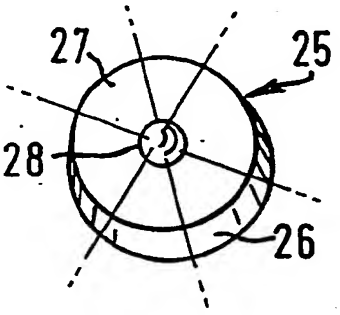


FIG. 8.

FIG. 9.

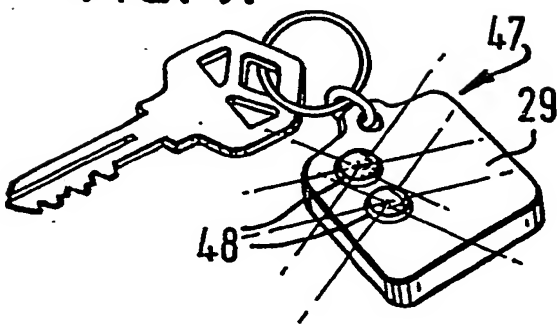
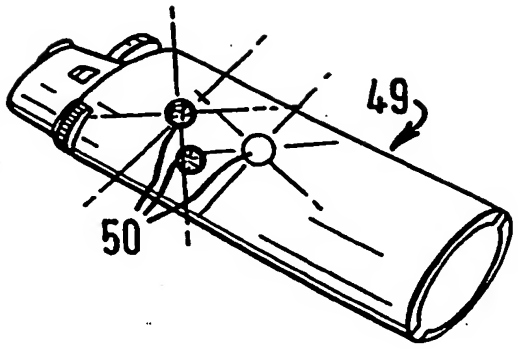


FIG. 10.



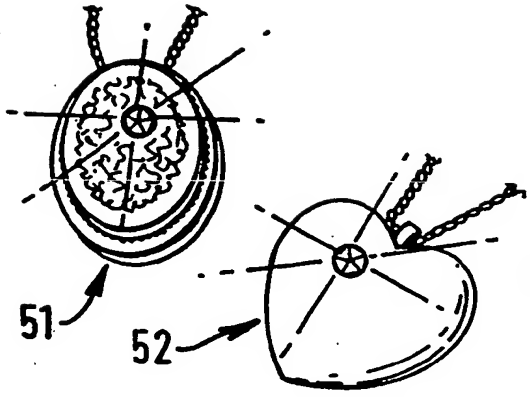
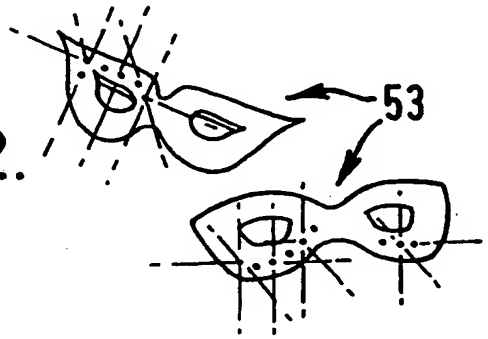


FIG. 11

FIG. 12.



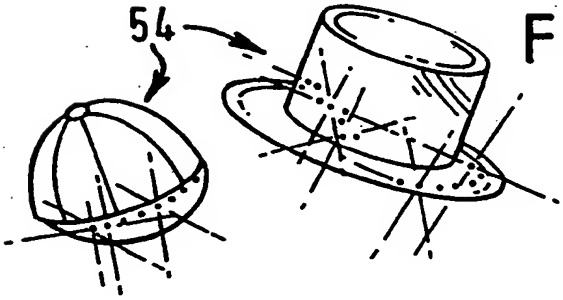
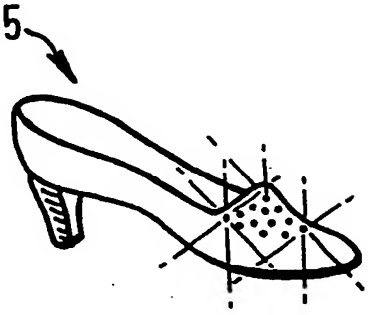


FIG. 13

FIG. 14.



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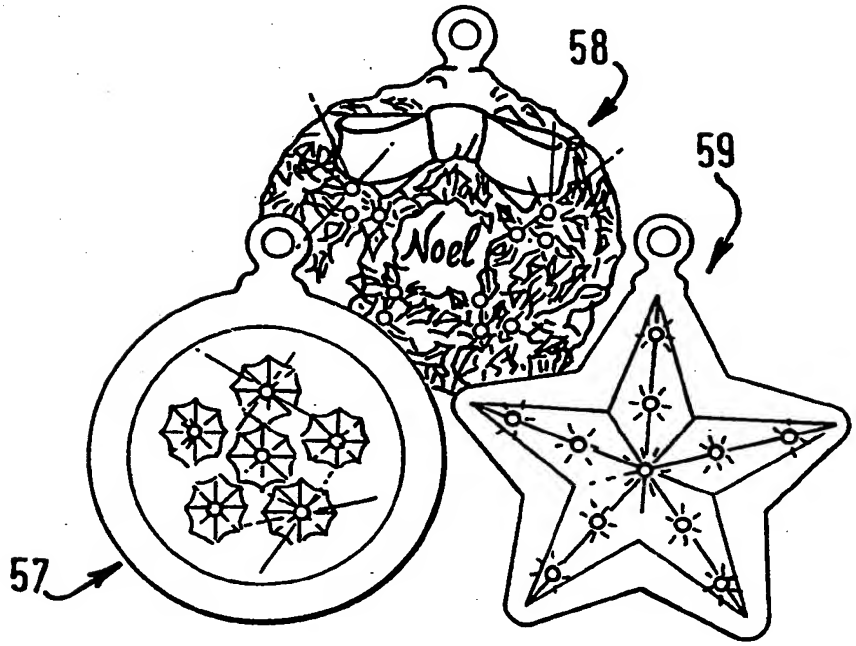
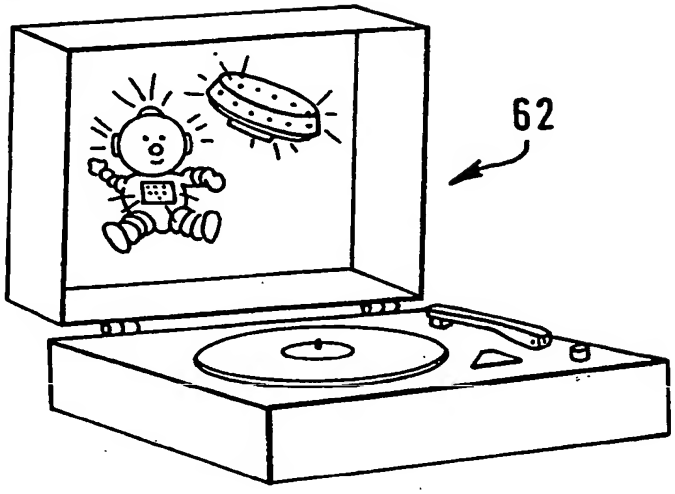


FIG. 16

FIG.17c.



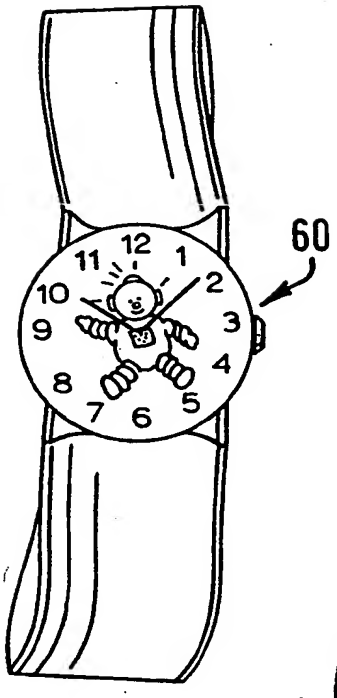


FIG.17a.

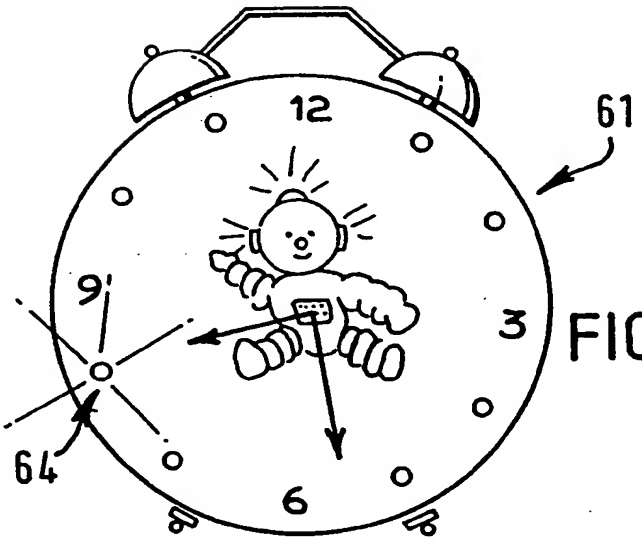
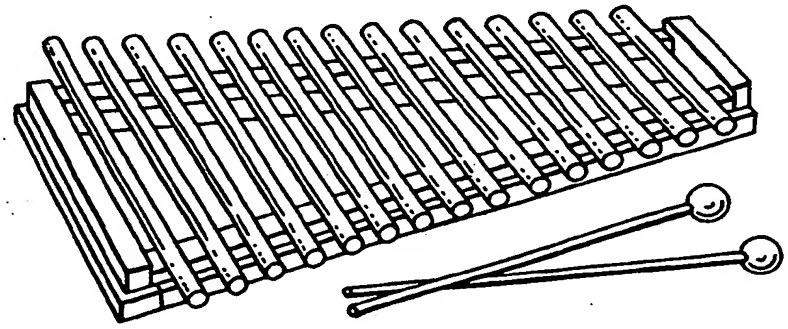


FIG.17b.

FIG. 18.



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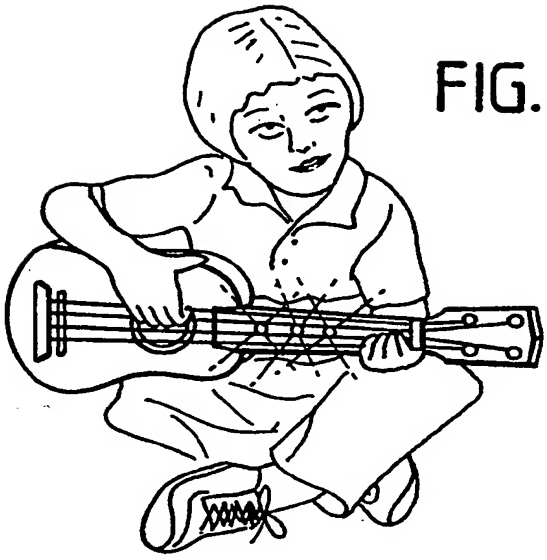

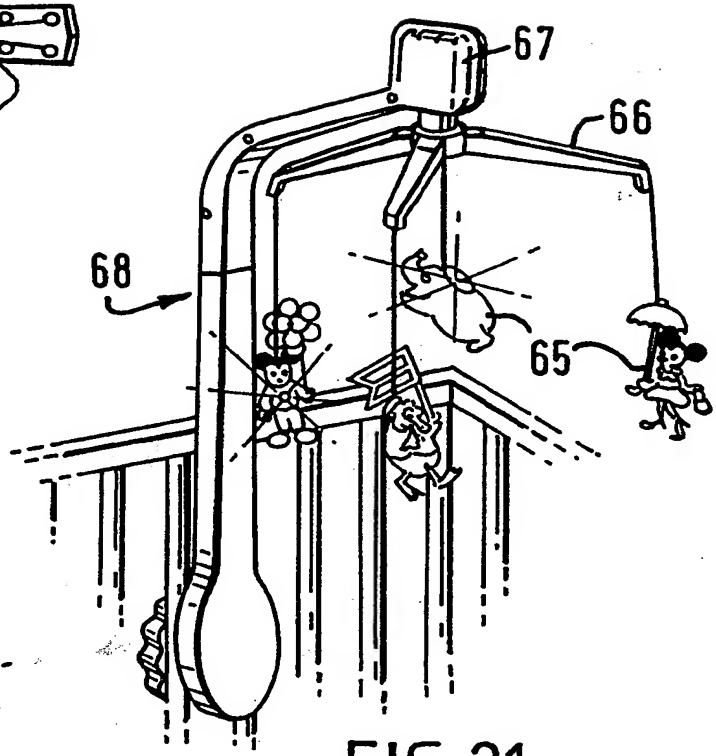

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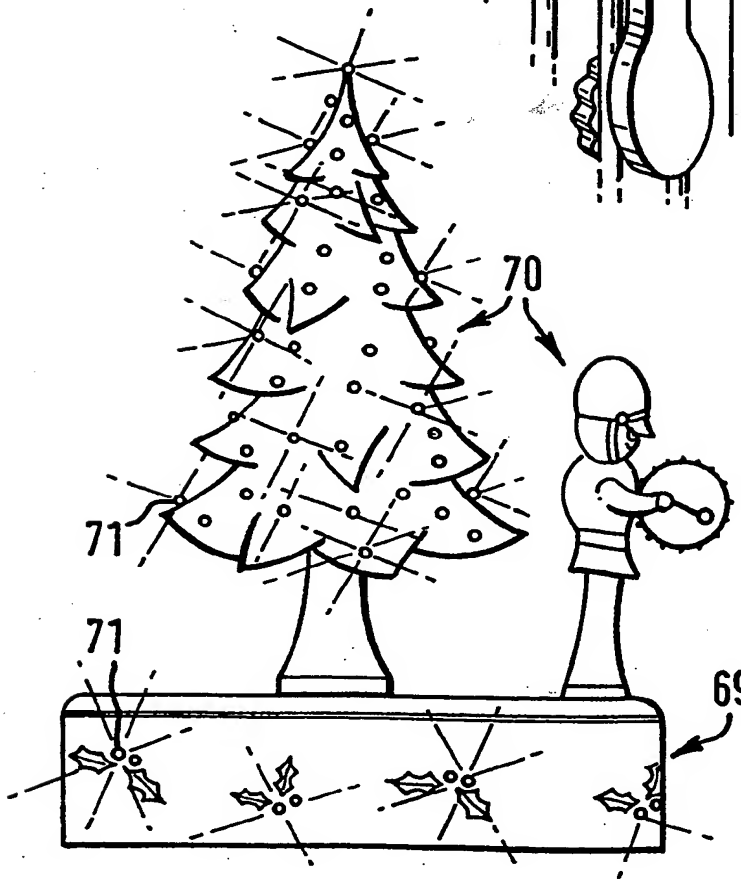

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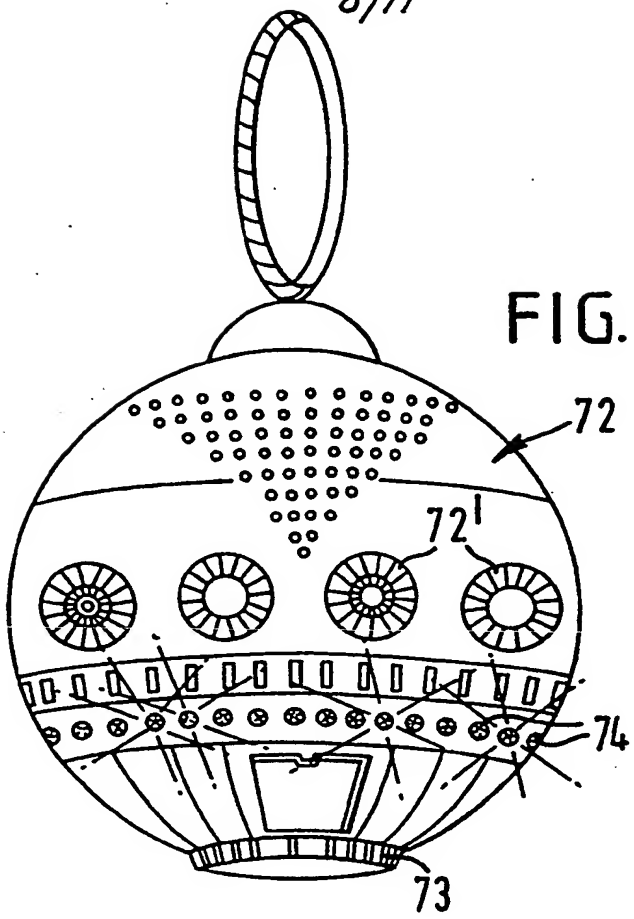

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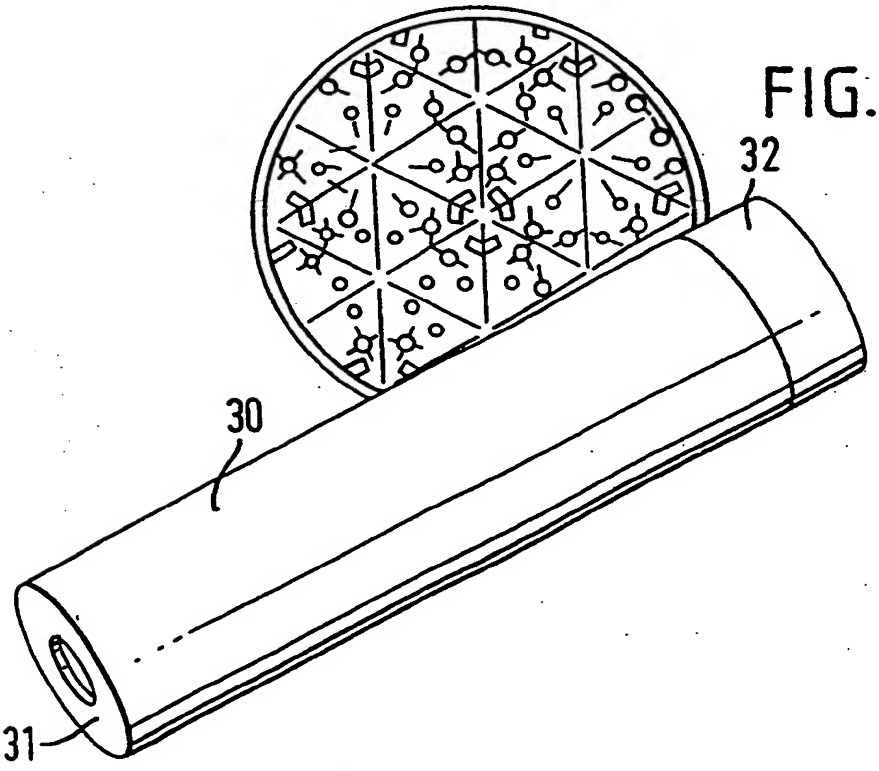

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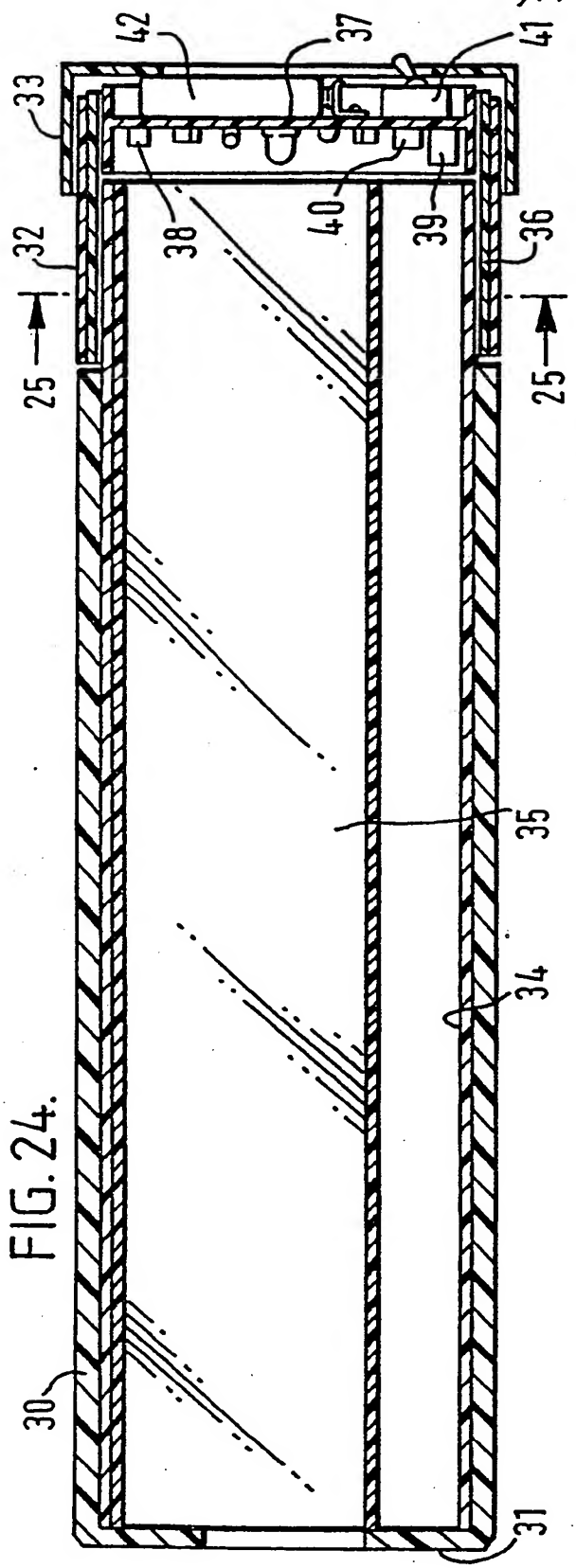

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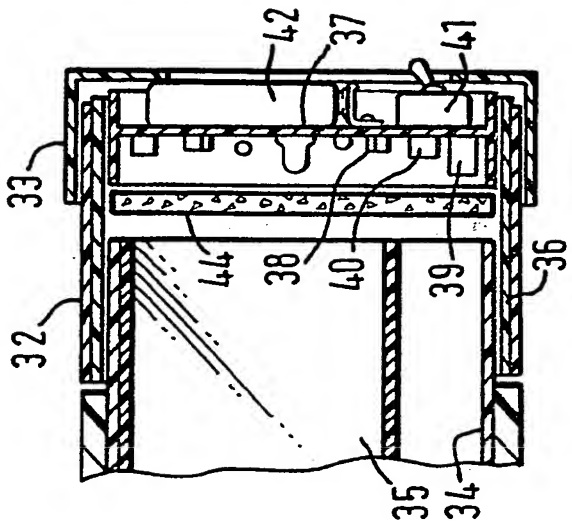

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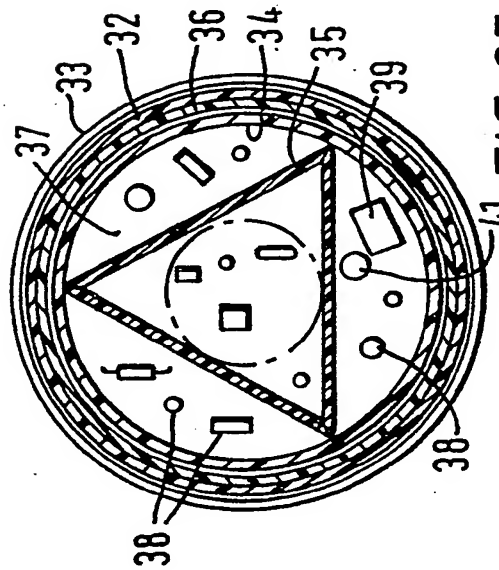

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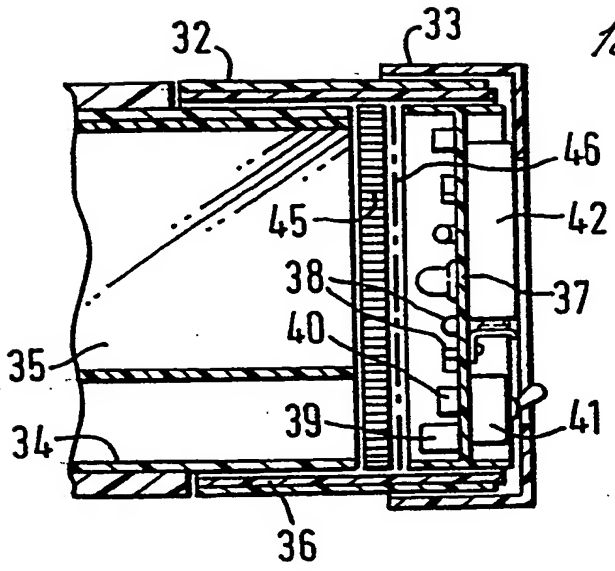
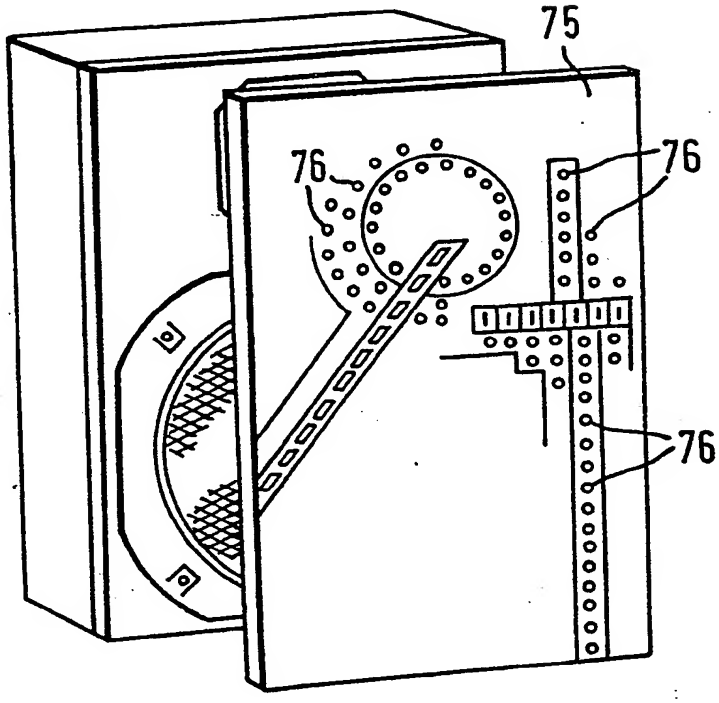


FIG. 27.

FIG. 28.



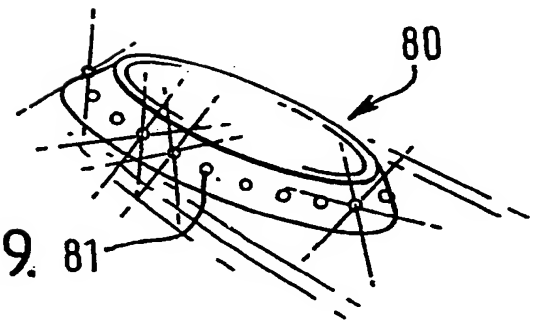


FIG. 29.

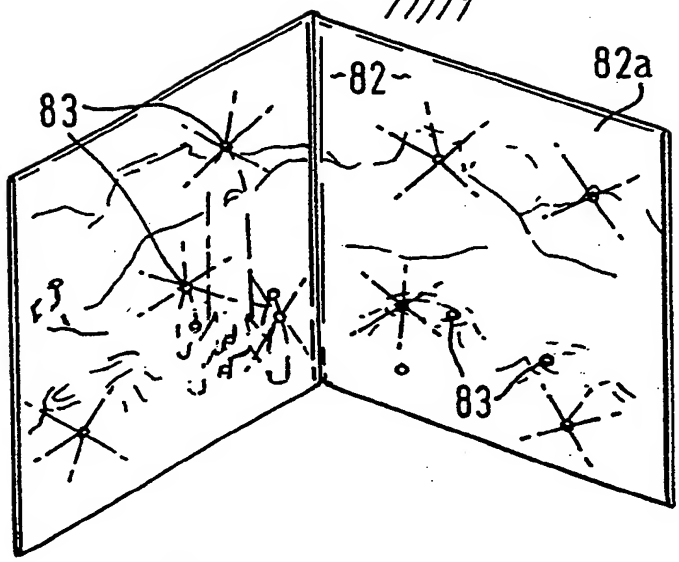


FIG. 30.

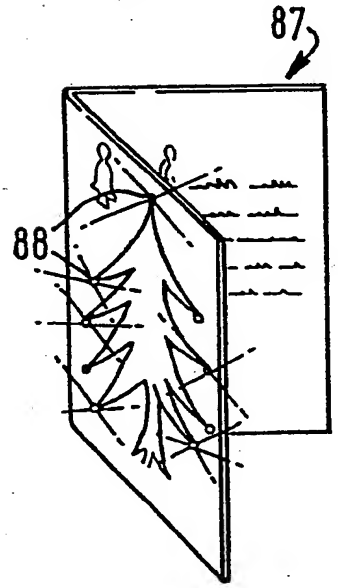


FIG. 32.

FIG. 31.

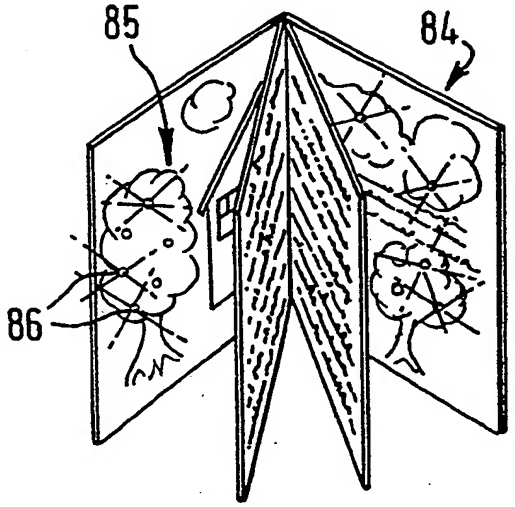
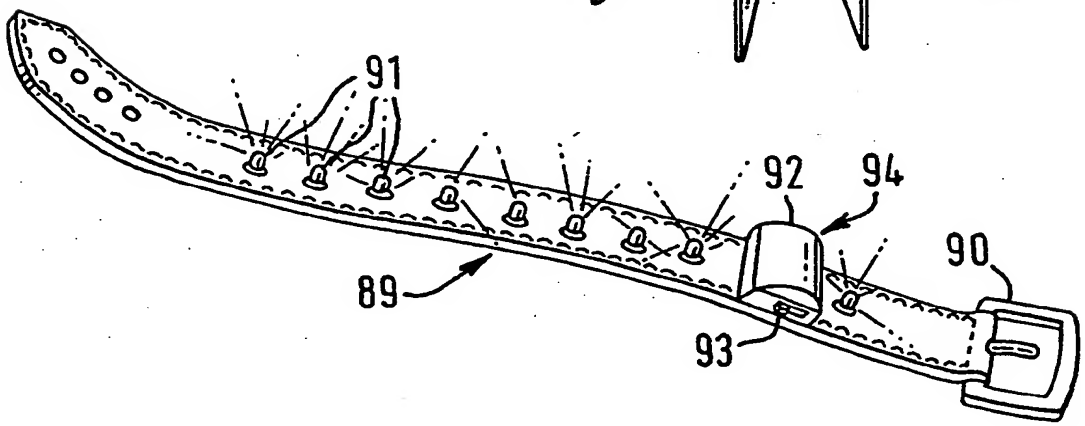


FIG. 33.



SPECIFICATION

Sound responsive lighting system and devices incorporating same

This invention concerns sound responsive lighting systems and to various articles to which such systems may be applied.

In a first general aspect, the invention is concerned with the problem of positional location in the dark and aims to provide a system which can respond to sound so as to emit light so identifying the location of an article in which the system is incorporated. A number of specific examples of this aspect of the invention will be described in detail herein.

In a second general aspect, the invention seeks to provide a system which provides an enhanced pleasing visual effect in response to sound, the effect being apparently partly random and yet also partly and/or wholly dependent upon the activating sound. In this aspect, the variations in sound level and/or frequency in for example voice and musical sound is utilised to generate dynamic light patterns to create the visual effect from the sound thereby enhance the effect upon the listener or viewer and in some cases to add to an article already intended to have visual appeal a further "dimension" of visual effect. There will later be described a number of specific examples conforming to this aspect.

In a third general aspect, the invention seeks to provide aids for teaching, for example by enhancing the interest to children in learning to read, to tell the time, to play musical instruments etc, and also to provide aids for the handicapped. For example certain embodiments to be described will be of special benefit to the deaf or hard of hearing by creating from a sound or sounds which would be inaudible to them a visual stimulus to convey in part some aspect of the sound. These latter benefits will be closely associated with either or both of the first and second aspects in certain embodiments to be described. For example, certain devices providing positional location also can be used to provide for a deaf person the necessary visual signal or warning indicating the occurrence of a certain sound, while other devices intended for example, to enhance the enjoyment of music can provide for a deaf person a means for appreciating in visual terms the variation of sound frequency and level occurring in musical sound.

Various further examples utilise the effects of both the first, second and third aspects in varying degrees and proportions according to the nature of the article concerned and its function.

In accordance with the first aspect of the invention there is provided a sound responsive lighting system comprising:

a sound transducer;

at least one light source; and

control means coupled to control the energisation of the light source in accordance with the sound detection by said sound transducer such that in the absence of sound having a predetermined acoustical characteristic said light source remains de-energized.

The said acoustical characteristic may constitute a predetermined sound level as detected by a threshold detector coupled to the transducer. The threshold may be set at any desired level, for example a level which is greater than a normal ambient sound level so that the device will respond only when it experiences an abnormally high sound level, for example a level which would require a sound volume higher than that of the human voice at a normal speaking level. In this way, unwanted response of the device in normal ambient sound level situations can be inhibited. Since in its simplest form the device is permanently energised by its own battery power source, this preferred feature will serve to avoid unnecessary power waste and so maximise the battery life.

The lighting system of this first aspect can be incorporated in specific articles which it may be desired to locate in the dark, or which for other reasons it may be desirable to illuminate temporarily in the dark, or it may be incorporated in a locating device which can be placed where desired for location in the dark, for example on or adjacent an article such a telephone so that article can readily be located when the device is energised in a sound responsive manner.

In accordance with the second aspect of the invention there is provided a sound responsive lighting system comprising:

a sound transducer;

a plurality of light sources;

control means for controlling the energization of the light sources in accordance with the response of the sound transducer, said control means being arranged to cause said light sources to be activated in response to said sound in accordance with a predetermined response program to create a dynamic pattern of light source illumination while the activating sound continues.

A particular example of the use of a system according to the second aspect is a kaleidoscope, and a particular form thereof will be described later in detail. This example is illustrative of the advantages which can be derived from the application of a system according to the invention to a particular article. In this case the advantages comprise the ability to operate a kaleidoscope in the dark or in poor light conditions which would be insufficient for conventional kaleidoscopes relying on ambient light entering one end for refraction therein by randomly distributed coloured glass or plastics fragments. Furthermore, the greatly enhanced dynamic visual effects obtained by virtue of the sound responsivity of the device produce a much greater visual appeal than in conventional kaleidoscopes where the observed pattern changes only in response to the rotation of the casing.

The circuits can be applied to enhance the visual effect of a wide variety of articles intended in themselves to give pleasing visual effects, and

in so doing afford a variety of functional advantages which will be described in each case below.

The control means can for example include any number of threshold detectors and/or frequency filters and can be arranged to derive from the output of the transducer an analog signal the varying amplitude of which causes the production of a corresponding pattern of digital signals employed for the energization of the light sources. The arrangement of the light sources in the particular device concerned and/or the arrangement of a decoder in the output stage of the control means can be such as to provide an ordered sequence of illumination of light sources in an array, e.g. a linear array, or to provide a pseudo-random energization pattern which, though predetermined, creates the impression of a random sequence of energization.

The control means may be arranged so as to provide variation in the rate of sequential energization of the light sources according to the sound level so that, for example, as the sound level increases the rate at which successive light sources are energized increases. This can create a visual pattern which in a sense matches the mood of sound, for example music, to which the device responds by forming a relatively slowly changing pattern in quiet passages and a much more dynamic display in the louder passages. The light sources can be regulated so that the duration of the visual effect can be made shorter or longer depending upon the sound input or function of the device.

The present invention also provides an article of any of the general or specific types disclosed herein incorporating a sound responsive lighting system in which the energization of at least one light source is controlled in accordance with sound detection by a sound transducer, the activation of the said at least one light source being dependent upon the presence of activating sound.

The specific advantages and effects of the present invention and its application to numerous different types of articles will because apparent from the following description of a number of preferred embodiments, made with reference to the accompanying drawings, in which:

Figure 1 illustrates schematically in greatly simplified form the essential elements of a lighting system in accordance with the invention;

Figures 2 and 3 illustrate schematically respective front and rear ends of a particular form of control circuit for controlling a lighting system according to the present invention;

Figures 4 and 5 represent respective modified forms of the rear end of the control circuit to be used in place of the circuit of Figure 3;

Figure 6 illustrates a switch plate incorporating a lighting system according to the present invention;

Figure 7 illustrates a digital watch incorporating a lighting system according to the present invention;

Figure 8 illustrates a miniature and portable self-adhering sound-responsive locating device according to the present invention;

Figure 9 illustrates a key-ring incorporating a lighting system according to the present invention;

Figure 10 illustrates a lighter incorporating a lighting system according to the present invention;

Figure 11 illustrates two items of jewellery in this case pendants incorporating a lighting system according to the present invention;

Figures 12 to 15 illustrate various different items of clothing and costume incorporating lighting systems according to the present invention;

Figure 16 illustrates three different forms of Christmas ornaments incorporating lighting systems according to the present invention;

Figures 17a, 17b and 17c illustrate respectively an alarm clock, a watch and a record player with self contained pictorial and/or graphic display, all incorporating lighting systems according to the present invention;

Figures 18 and 19 illustrate examples of musical instruments incorporating lighting systems according to the present invention;

Figure 20 illustrates a musical box incorporating a lighting system according to the present invention;

Figure 21 illustrates a musical mobile incorporating a lighting system according to the present invention;

Figure 22 illustrates an example of a portable radio incorporating a lighting system according to the present invention;

Figure 23 illustrates the outward appearance of a kaleidoscope incorporating a lighting system according to the present invention, as superimposed on a representation of a typical image pattern which can be observed therewith;

Figure 24 is a longitudinal cross-sectional view of the kaleidoscope illustrated in Figure 23;

Figure 25 is a view, taken on line 25—25 of Figure 24 illustrating the possible light source placement, the possible location of electronics inside the kaleidoscope at the light source end of the kaleidoscope in Figures 23 and 24;

Figures 26 and 27 illustrate modifications of the arrangement in the end cap of the kaleidoscope of Figures 23 to 25;

Figure 28 illustrates an example of a decorative loudspeaker cover incorporating a lighting system according to the present invention;

Figure 29 illustrates a throwing disc incorporating a lighting system according to the present invention;

Figure 30 illustrates the album cover for a gramaphone record, the cover incorporating a lighting system according to the present invention;

Figure 31 illustrates a picture story book incorporating a lighting system according to the present invention;

Figure 32 illustrates a greeting card

incorporating a lighting system according to the present invention; and

Figure 33 illustrates a pet collar incorporating a lighting system according to the present invention.

A system according to the present invention in its basic form is illustrated in Figure 1. It includes a sound transducer in the form of a microphone 1 for producing on its output line 2 an audio signal corresponding to the detected sound. This audio signal is supplied to a control circuit 3 which responds by controlling the energisation of one or more light sources 4 through a driver circuit 5. The control circuit 3 can perform its control function in accordance with predetermined conditions and parameters. For example, it may operate in accordance with a predetermined threshold so as to operate the lights 4 only when the audio signal on line 2 has reached the threshold. Thereafter, the lights continue to be energized only while the audio signal lies above that threshold, except that a delay circuit 6 is preferably provided to maintain operation of the lights for a predetermined period after the audio signal falls below the threshold.

The control circuitry 3 may be as simple or as complex as the particular application for the device requires, and Figures 2 and 3 illustrate one form of the Figure 1 arrangement which can be widely applied to the entire range of products illustrated in Figures 6 to 33. There now follows a description of the circuit of Figures 2 and 3.

Although the circuit of Figures 2 and 3 is used in basic form throughout the illustrated range of products, the circuit can be adapted in accordance with the requirements of the particular products. The essential function of the circuit is to drive the light sources; these sources are preferably light emitting diodes as the power consumption of these types of lighting elements is extremely low, but miniature incandescent lamps can also be used. The control of loads of much higher rating can be achieved by using opto-isolator devices which are silicon controlled switches optically coupled with the low rated light sources 4.

The circuit can be made to be responsive according to the frequency or amplitude of the detected sound, or to a combination of both, and the characteristics of response can be preset by appropriately selecting the circuit components according to the requirements of each product.

The flashing of the light sources in response to the sound occurs in a programmed fashion according to the circuit components and wiring, and can produce pseudo random or sequential ordered pattern according to their positioning on or about the specific product concerned.

The components of the basic circuit to be described may be carried on a single circuit board, which may also carry the light sources themselves, or whatever interfacing devices may be necessary for driving the other loads. Preferably, the circuit comprises a single integrated circuit chip. The physical characteristics of the circuit can be adapted for the particular use intended; for example, the circuit can be made sufficiently thin to be located behind or between layers of material.

The circuit can be powered by whatever source may be most appropriate to the particular product concerned, e.g. battery, mains, solar. The circuit to be described requires a power source of from 3 volts DC to 15 volts DC as described above in connection with element 6 of the circuit of Figure 1, the circuit can be provided with a power saving function such that the sources turn off when there is an absence of sound of appropriate acoustical characteristics, e.g. frequency and/or amplitude, for a predetermined time.

With reference now to Figures 2 and 3, the illustrated circuit can be notionally divided into three parts, namely the analog acoustic circuit, the sequence logic circuit, and the output drive circuit. Figure 2 illustrates the analog acoustic circuit 7 and Figure 3 illustrates the sequence logic circuit 8 and the output drive circuit 9.

The general function of the analog acoustic circuit is to sense the sound by means of an acoustical transducer and to process the acoustic signal so produced to supply a compatible output to the sequence logic circuit. This analog acoustic circuit is universally applicable for the whole range of products. The sensitivity of this circuit to amplitude and frequency of the detected sound is preset by appropriately selecting the values of the circuit components.

The acoustical transducer comprises a microphone 10, preferably an electret microphone, appropriately mounted in the product so as to be capable of detecting ambient sound. A resistor R_m is connected between the microphone and the power supply terminal 11 to provide the required voltage source for the microphone. The size and sensitivity of the microphone can be selected according to requirements.

The microphone responds to sound to produce an audio signal which is coupled by a coupling capacitor C_c to one input of a differential operational amplifier 12. The other input of the amplifier 12 is connected to the junction point of a voltage divider R_d. A feedback for the operational amplifier comprises parallel coupled feedback resistor R_f and capacitor C_f. This first stage of the analog acoustic circuit serves to amplify and filter the acoustic signal, the frequency response characteristics being determined by the values of the coupling capacitance C_c and the feedback components. The operating point of the operational amplifier is determined by the values of the components in the voltage divider.

The second stage of the analog acoustic circuit constitutes a pulse generator of which the output is derived from the complex envelope of the acoustic signal as put out by the amplifier 12. Parellel coupled input capacitor C_i and R_i are conjointly connected by a diode D to the connection between the amplifier 12 and a

further amplifying stage 13. These input components function to detect the transitions in the output of amplifier 12 by tracking the most previous transition and allowing the maximum difference between the inverting and non-inverting input of the amplifier 13 at the peak of the new transition. This provides a saturating output from the amplifier in either the source or the sink condition. The frequency and amplitude sensitivity characteristics are determined by the values of the input components R_i, C_i.

The analog acoustic circuit of Figure 2 can preferably comprise a low power, high gain dual operational amplifier, such as the LM358 device which is a standard product generally available. This device provides signals sufficient to drive directly CMOS integrated circuits powered at the same voltage.

The pulse output of the analog acoustic circuit of Figure 2 is supplied to the input of the sequence logic circuit 8 of Figure 3. The sequence logic circuit is used to establish the rate of visual response to the input sound as well as the primitive order in which the drivers will turn the light sources on and off. The circuit provides parallel output digital signals for the output drive circuit 9 and comprises a binary circuit consisting of any multiple stage CMOS binary counter of a sufficient number of orders to satisfy the display design parameters. The Figure 3 circuit uses a CD4024 counter 14 having seven stages of which only three are used to provide three decodable output lines 14a to the driver circuit, so as to provide a one-of-eight sequential or pseudo random control of an array of eight light sources. The binary output signals from the counter are supplied to a decimal decoder 15 which in its basic form can provide up to a one-of-ten display pattern. In the illustrated circuit, however, the decoder is used in a one-of-eight mode to energize the driver circuits for the respective light sources in accordance with the input binary digital signals on lines 14. The wiring of the driver circuits to the outputs of the decoder determines the order of energization of the light sources in response to the sequential outputs on the eight output lines of the decoder.

The sequence logic circuit also provides an output enable signal on line 16 which is optionally available for use, in particular with CMOS drive circuits. An RC network comprising capacitor C_e and resistor R_e is coupled at the output of any low order of the counter to provide a signal for the duration of the RC time constant to enable the display devices. When the amplitude of the enable signal exceeds the logic switching level of the driver enable, the light sources are disabled. The enable signal is only present when there is a sufficiently high frequency of pulses applied to the R_e, C_e circuit on the low order output of the counter.

The driver circuits provide the output current to energize the light sources according to the signals output from the decimal decoder. The components for these driver circuits can be either decoder/drivers or simply drive transistors in discrete form or as packaged arrays.

When binary sequence logic circuits are employed, the driver circuit is usually a decoder/driver, CMOS analog multiplexer or a transistor array which can sink or source current to the light source.

Digital sequence logic circuits usually require transistor arrays for driving light source arrays in combined sink/source logic conditions.

Arrays of light sources can also be driven logically using combined functions of analog multiplexers.

The driver circuits also provide the current limiting necessary to compensate for the voltage level at which the circuit is powered.

The circuit of Figure 3 illustrates how each output of the decimal decoder 15 can be used to energize either a single light source, such as LED 17, or a plurality of parallel connected sources 18.

Figure 4 illustrates a modification of the Figure 3 circuit which can be used to provide a more complex display. In this modified form of sequence logic circuit and drive circuit, four stages of the binary counter are used for one-in-sixteen control of a sixteen light source array. Accordingly, two decimal decoders 15 are required, and are appropriately wired to the outputs of the counter to provide the control of the sixteen sources. Each counter also receives the enable signal from the R_e, C_e network.

A further modification of the Figure 3 circuit is illustrated in Figure 5. Here, two digital circuits are connected in chain to provide a row and column drive signal capable of lighting one-of-one hundred light sources electrically connected in a matrix as illustrated.

Thus, to summarise, a pulse signal produced in accordance with the acoustical signal generated by the microphone are counted by a binary counter to produce a parallel binary digit output, this being decoded by a decimal coder to control the drive circuits for the respective light sources.

For a number of the products now to be described using a small number of light sources, e.g. up to three, the above basic circuit still applies, but is not used to its full potential; the outputs of the decimal decoder would be appropriately connected to the light sources to provide the required energization sequence. This leads to economy for the range of products since individually designed circuits would not be necessary.

As mentioned earlier, the light emitting diodes are preferred as the light sources since they require very little power. In the following examples of Figures 6 to 11 using up to only three LEDs the circuit may be wired so as to be permanently energized by a battery source, the power drain during periods when no light sources are lit being negligible. In the other embodiments where a greater number of LEDs is used, it is preferable, particularly where the power source is a battery to include a main switch to energize the circuit only when desired, thereby minimising the

power drain and maximising the battery life.

Figure 6 illustrates a switch plate 18 for a wall-mounted light switch. The plate is appropriately dimensioned and otherwise constructed as a unit which can readily replace a standard switch plate. In the illustrated example, it includes a rectangular aperture 19 through which the rocker member of the switch will protrude. The plate also is formed with an aperture 20 through which a light emitting diode (LED) 21 mounted on the rear of the plate is visible. A control circuit in accordance with the aforementioned first aspect of the invention is also carried on the rear of the plate and is connected to control the energization of the LED 21. The front face of the light plate may be formed, as shown, with a decorative relief pattern 22 around the LED aperture. The electret microphone is also carried behind the plate but may, if desired, be exposed through a further microphone aperture (not shown) provided in the plate. The sensitivity of electret microphone is such that the sound penetrating to the rear of the plate would be sufficient for the microphone to respond. The control circuit is battery powered, the battery also being carried on the rearside of the plate. In this way the unit is entirely self-contained and therefore easily installed, requiring no additional wiring. For replacement of the battery the plate will be removed for access to the rear side carrying the electronics.

The advantage of the Figure 6 device is that it can indicate the position of a light switch in a darkened room. Thus, someone entering the room need only make a sound of the required level to be given a visual indication of the light switch position.

In the example of Figure 7, a light system according to the first aspect is incorporated in a digital watch 23. The watch has the usual window display 24 of the digital time representation. One or more LED light sources are disposed within the casing to illuminate the window in response to the detection by a microphone also housed inside the casing. Here the LED chip is preferably built into the control circuit chip. The power may be taken from the battery powering the timer circuits of the watch. It is common to provide a push-button switch on the side of a digital watch for energizing a light source to illuminate the time display window. The invention as applied to a watch provides the advantage of enabling the illumination of the display window in response to a vocal instruction without the necessity for such manual operation. This can provide a very significant safety feature of particular advantage when the wearer is engaged in a two-handed operation such as driving a vehicle, or operating machinery. It can also be a useful aid to handicapped persons.

Although Figure 7 illustrates a digital watch, the invention is clearly applicable also to an analog watch and to other forms of analog and digital clocks and timing devices.

A development of this application may involve the provision of a fibre optic frame disposed around the inside of the display window or dial. The fibre optic could channel light from the LED or LEDs so as to provide a complete peripheral illumination of the window or dial.

Figure 8 illustrates a locating device 25 to which the invention is applicable in a similar manner as in the example of Figure 6. The unit, which comprises a body 26 housing within the microphone, battery and control circuit, and having an upper face 21 on which an LED 28 is carried, is a compact and portable device which can be freely placed where ever required to provide a guide to any given location in response to a sound signal in the dark. For example, the unit may be placed adjacent a bed side telephone to thus facilitate locating the telephone at night time. The unit can also provide additional advantages for the deaf or hearing impaired to signal visually the occurrence of a sound. For example, the unit could be placed in locations to indicate specific sound generating activity, e.g. doorbell, sound generating timer (e.g. oven timer) alarm/alert system (e.g. fire alarm).

In the example of Figure 9 a circuit according to the first aspect is incorporated in a tag 29 of a key ring 47. Mounted in the illustrated tag are two LEDs 48, for example of different colours. As applied in this example, the invention is useful in assisting in the location of the key ring in the dark in locating a key hole and is decorative. Similar advantages and characteristics are obtained in the example of Figure 10, which illustrates a lighter 49 in the casing of which are mounted three LEDs 50.

In examples of Figures 9 and 10 the control circuit, battery and microphone are housed within the key tag and lighter case respectively.

The invention is also applicable to items of jewellery and other articles of personal adornment, and Figure 11 illustrates two examples of this. The illustrated examples are pendants 51, 52 in which LEDs may be fixed, for example beneath a refracting coloured gemstone. Illumination may replace precious and semi-precious materials, may enhance the visual effects of such materials as well as enhance individual items of adornment.

Figures 12 to 33 illustrate various applications of a lighting system according to the invention in which a greater number of light sources than in the previous embodiments are used. In the examples illustrated in Figures 12 to 15, the invention is applied to items of clothing and costume, for example, masks 53, hats 54, shoes 55 and costume gowns 56, for enhanced visual appeal, impact and drama, or special effects. The use of LEDs as light sources of low energy consumption may replace refractive/reflective material, and/or high power light sources, thus creating flexible energy efficient applications. The lighting systems may be embodied in mass-consumer items as well as professional production applications.

The invention is also applicable to decorations having a seasonal theme, e.g. Christmas. Figure

16 illustrates, for example, three different forms of hanging Christmas ornaments 57, 58, 59. Each is made of material molded or formed into traditional Christmas shapes, such as a wreath 58 or Christmas star 59. The ornaments are designed to be hollow and will house the control circuit which could drive LEDs or incandescent lamps which are an integral part of each ornament design. The battery source and microphone are also housed within the ornament. A switch is appropriately positioned for ease of operation. Each unit is totally self-contained. These decorative items provide a pleasing sound responsive effect and can enhance the attractiveness of for example, a Christmas tree which is otherwise unilluminated or illuminated with conventional lights or with a set of sound responsive lights to be described below. The product can also be used as wall decorations, window dressing, table top decorations. Any shape relevant to a given season may be produced.

The ornaments of Figure 16 may be modified so as to be strung together so that several units are interconnected and the total number of ornaments on the string may be powered by a single battery source or AC/DC current. Further when strung together the arrangement can be such that the ornaments illuminate either in response to sound or may illuminate irresponsive to sound, using the same principle as described below for a string of lights.

To continue with the application of the invention to traditional Christmas tree products, the light sources can be incorporated into a string of lights which could replace existing traditional strings of incandescent lamps and could be used to illuminate in any desired decorative manner. Again, the light sources are preferably LEDs providing the advantage of lower power consumption and product longevity. A control unit for the light string will comprise a casing housing a control circuit appropriately designed to be capable of producing illumination of the lights in a sound responsive manner. Preferably, the unit will also be designed to provide the option of constant light illumination and flashing illumination in a non-sound responsive programmed manner. The advantage here is that whereas conventionally Christmas tree lights are either permanently on (either continuously or flashing) or off, the above described Christmans light string system according to the present invention, when switched into the sound responsive mode will illuminate only when there is sound in the room in which the control unit for the string is placed. This serves to avoid power wastage without the necessity to switch the unit off when the illuminated display is not needed. It is envisaged, for example, that the device will respond to human voices at a normal speaking level, with an appropriate inbuilt delay, so that the energization of the lights in a sound responsive manner continues while a room is occupied by people producing a certain level of sound through normal conversation. The system would also provide a pleasing effect in response to music. Such strings of lights may be powered either by battery or by means derived AC/DC current. Where LEDs are used there is the additional advantage of drastic reduction of fire risk since there is no heat output with such sources. Also, the longevity of LEDs brings particular advantage in this application.

Articles incorporating lighting systems of the invention may be designed with particular, but not exclusive appeal for children, and Figures 17a, b and c illustrate examples of this type of article, namely a childs watch 60, alarm clock 61 and record player 62 respectively. The invention may be programmed in all aspects depending on the specific requirements and opportunities of the product. For example the clock 61 may be programmed to illuminate a central feature character 63 in response to sound (e.g. voice, clap of hand etc.). Further, on the hour, numerical value of time will light in response to an internally generated audible signal. More specifically at 8 o'clock, eight beeps will be accompanied by 8 flashes of the LED 64 at the 8 location on the clock's face—and so on, thus teaching (reinforcing) the child to count and tell time simultaneously. Overall the sound responsive lighting feature makes learning fascinating. Same characteristics may be incorporated in watches, both digital and analog. Other examples of articles in this category to which the invention is to be applied include money banks, character toys, childrens calculators, cassette players, pencil sharpeners, phonographs, pocket cameras, toys, lamps.

Figure 21 illustrates a device known as a cot mobile. This is an article to be affixed to the head end of a cot as illustrated to provide visual comfort to an infant lying in the cot. The illustrated device is of the type in which a number of visually appealing figures 65 are suspended from the ends of outwardly projecting arms 66 of a suspension frame. This frame can be rotated by a motor housed in an end part 67 of the main support frame 68. To apply the invention to such a device, the light sources would be mounted in or on the suspended figures and the control circuitry housed within the main support frame. The particular advantage to be derived from this application of the invention lies in the fact that the device can become automatically energized in response to sound made by the infant in the cot at least for the sound responsive energization of the light sources thereby immediately to provide a soothing visual effect. The mobile could also include a music source to which the sound responsive lighting system can respond.

Figures 18 and 19 illustrate two examples of the application of the invention to musical instruments, in this case a childs guitar and xylophone. This application is not limited to *only* children's musical instruments, it may be appropriate to adult appeal.

The application of the invention to any musical instruments will produce a unique visual effect as

well as the audio effect. This may result in increasing an individual's interest and capability in music. Further the invention may be programmed to pitch and to intensity of pitch which could enable the hearing impaired to develop, and/or enhance, musical skills. In the case of childrens musical instruments, the visual effect produced by the lighting system in response to the sound made by the musical instrument may, through its appeal and entertainment stimulate and encourage the childs interest in music.

The invention may be incorporated into self-contained musical boxes wherein the LEDs could be (or enhance) the decoration and/or lighting in response to the music. In the Example of Figure 20 the invention is applied to a musical box having a decorative turntable 69 carrying figures and/or ornaments 70 which may become animated when the device operates. In the illustrated example, both the turntable itself and the figures mounted thereon carry light sources 71 arranged to be illuminated by a control circuit in a sound responsive manner, either in accordance with the music produced by the musical box itself, or in accordance with any other sound, to enhance the visual appeal of the device.

In the Example of Figure 22 the invention is applied to the decorative casing of a compact radio. The casing 72 of the radio of this example is of spherical form. At the base of the radio casing is a disc like station selector knob 73. An array of light sources 74 is circumferentially spaced and carried in and exposed outwardly of the radio casing. These sources are connected to be controlled by a control circuit of the type basically described hereinbefore and adapted to provide control for the relatively large number of light sources. The advantage of this application of the invention, particularly where the radio is of a compact form, is two-fold. Firstly, the display device can respond to the sound produced by the radio itself so as to enhance the entertainment provided by the sound from the radio. Secondly, if the lighting system is independently switchable, the radio may be used purely as a sound responsive decorative amusement which may respond to any sound even when the radio itself is turned off.

Figures 23 to 27 illustrate another application of the invention. The product here is a kaleidoscope incorporating a sound responsive light emitting device. In this example, the kaleidoscope comprises a two-part cylindrical housing of which a forward part 30 includes a centrally apertured end plate 31 through which the pattern to be produced is viewed. A rear part of the outer tubing 32 is axially rotatable relative to the forward part 30 and has removably fixed to it an end cap 33. Relatively fixed within the forward tube 30 is a reflector tube 34 within which three elongate rectangular reflective elements 35, each providing a reflective surface, are fixed relative to one another in an equilateral triangular prismatic configuration so as to form a reflective triangular section tunnel extending from the end plate 31 to a position within the rear tube 32. Within the rear tube 32 is fixed an end tube 36 into which the reflector tube 34 projects in rotationally sliding engagement therewith. Fixed within the rear end of the end tube 36 is a circuit support disc 37 the inside circular face of which may carry a plurality of differently coloured light sources 38 and the various circuit components, comprising or consisting of an IC chip 39 and an electret microphone 40 providing a control circuit for producing sound responsive control of the energization of the light cources (preferably LEDs) 38. Mounted on the rear face of the support disc 37 is a battery 42 and a switching mechanism 41.

In use, a triangular portion of the array of light sources 38 on the support disc 37 is viewed through the triangular reflective tunnel in which the known kaleidoscopic effect is produced by multiple reflection by the reflective elements 35 to produce a viewed image consisting of a plurality of images of that triangular portion, relatively positioned. An example of such an image created is illustrated in Figure 23. Further, various combinations of translucent materials may be installed inside the tubing at the end of the reflective tunnel allowing the light source to produce even more variations of kaleidoscope imagery.

As the rear tube 32 of the outer casing is rotated relative to the forward tube 30, the end tube 36 rotationally slides on the inner end of the reflector tube 34, and the circuit support disc 37 rotates with the end tube 36. Accordingly, the triangular portion of the LED array facing the inner end of the triangular reflective tunnel changes so that each triangular portion of the composite circular image viewed from the viewing end of the kaleidoscope changes correspondingly.

Since the support disc 37 fits in the end of the end tube 36 in a light-tight manner, the background to the light images in the composite viewed image is black, as shown in Figure 23. Preferably, the LEDs are of varying shape colour and size to increase the variation in the viewed pattern.

The energization of the LEDs 38 is controlled by the control circuit in accordance with the sound detected by the electret microphone 40 to produce a further "dimension" of pattern variation in addition to that achieved by turning the end tube 32.

It will be appreciated that interesting, varied and beautiful effects can be produced by a kaleidoscope, such as that illustrated above, providing a sound responsive light pattern.

The switch 41 in the illustrated embodiment is a simple manually operated rocker switch, but it will be appreciated that other forms of switch can be used. For example, a gravity operated mercury switch can be arranged so as to de-energize the sound-responsive control circuit when the kaleidoscope is in a vertical orientation, so that whenever the device is stood on its end the circuit will be switched off.

The manner in which the different LEDs 38 enter and leave the triangular field of view defined by the mutual positioning of the three reflective elements 35 as the assembly comprising the rear tube 32, end tube 36, end cap 33 and support disc 37 rotate can clearly be seen from Figure 25 which also indicates the relative size and position of the viewing aperture in the end plate 31, as a dashed circle.

Certain modifications of the illustrated kaleidoscope will now be described.

In the first modification, illustrated in Figure 26, there is disposed between the end of the reflector tube 34 and the support disc 37 an insert 44 carrying an array of coloured light transmissive elements, which may be made of any translucent material such as glass or plastics. These coloured elements may be fixed relative to one another to form a stationary element array, or may be free to fall so as to provide a randomly variable element array. In the latter case, the elements will be disposed in a gap formed in the insert in the same manner as in a conventional kaleidoscope. The provision of this insert permits a smaller number of LEDs to be used since the pattern produced is now made more complicated by the element array. The insert may either be held fixed relative to the reflector tube 34 or may rotate with the end tube 36. The previously mentioned arrangement for free fall of the coloured elements is applicable to this latter case.

In the second modification, illustrated in Figure 27, an insert between the inner end of the reflector tube 35 and the support disc 37 comprises a bundle of optical fibres which again can be either fixed relative to the reflector tube 34 or can rotate with the end tube 36. The fibre optical insert can be arranged to produce from each LED a plurality of light images falling within the triangular field of view at the end of the reflective tunnel. Where the fibre optical insert is fixed relative to the reflector tube, there may be provided an apertured cover at the face of the insert which faces the LED array. This can further vary the light pattern obtained by rotation of the end assembly.

So far as this particular device is concerned, the invention also embraces a kaleidoscope of a generally known construction but provided with its own diffuse light source at the end carrying the freely movable coloured elements.

In all of the above construction of kaleidoscope the advantages obtained are that the kaleidoscopic effect can be viewed when there is little or no ambient light.

Figure 28 illustrates one example of the application of the invention to a decorative sound responsive panel. In this example, the panel is a loudspeaker cover 75 on which a multiplicity of light sources 76 such as LEDs are arranged in any desired pattern. In the illustrated example, the LEDs are arranged in straight and curved line groups of different colours. The control electronics, microphone, switch and power source are mounted in and at the rear of the panel. The panel can be specifically designed to be attached to the front of a particular design of loudspeaker, or can be of a general purpose type. In either case, the panel provides the advantage of replacing the usual rather functional and uninteresting appearance of a loudspeaker with an interesting and visually entertaining appearance. The speaker panel can be operated to respond to the sound emanating from the loudspeaker itself, or can be switched at other times to provide a totally independent decorative visual display device.

In a similar manner to that of the example of Figure 28, display devices can be applied to a wide variety of articles of a generally artistic nature to enhance the visual effect of the article or in some cases to permit features of the article to be appreciated where this would not otherwise be possible. For example, lighting systems according to the invention can be used to emphasise features of shape and pattern in an art form to permit some appreciation of the art form for people of limited vision. The bright dots of light emitted by the light sources could be seen by many people who would not be able to see the outline of the work itself.

In this respect, the invention is not limited to two-dimensional works but may be applied to decorative three-dimensional objects and works for example table top, shelf, wall art or floor standing articles.

Figure 29 indicates one example of the application of the invention to an article used in a throwing game. The particular article illustrated is a throwing disc 80 in which light sources 81 are disposed around the circumference of the plate-like article. The microphone is placed so as to respond to the sound or pressure variations produced when the disc is thrown through the air and the control circuitry and battery are positioned so as not to upset the balance of the article. In this aspect, the invention is applicable to other thrown articles such as boomerangs, balls etc. and the advantage is obtained that the game can be played in the dark or in conditions of poor light. Moreover, when the article is not caught, it can be readily located by virtue of its sound response to produce illumination. In the example of Figure 30 the invention is applied to the cover 82 of a gramophone record. Gramophone record sleeves today are commonly of the opening type in which one side forms a sleeve for the record and which in its opened state provides a pictorial or graphic representation which may have some connection with the music on the record. In this aspect of the invention this type of record cover is modified by the provision of a plurality of light sources 83 positioned about the inside surfaces of the cover. The control circuitry for illuminating the light sources in a sound-responsive manner is located between the carboard sheets forming the cover. For example, flex circuits are known, these being circuits of minimal thickness, and it is envisaged that such a circuit for controlling these lights can be made. Also very thin batteries (e.g. the polar

pulse battery made by Polaroid) are known and could be used.

This example of the invention is intended to provide a novel and appealing additional aspect to the enjoyment of the music of the record. In addition, the album cover, which need not be of the above-mentioned opening type, but can also be of the single sleeve type, becomes more than a protective storage sheath, it gives dimension to a flat pictorial and becomes an independent art form which has use with or without the record.

The example of Figure 31 is somewhat similar to that of Figure 30 and comprises a picture story book 84 in which the pictures 85 on one or more of the pages are appropriately embellished or decorated with an array of light sources 86, a sound responsive light circuit being carried by the book, e.g. on the rear cover or in the spine, to control the light sources in a sound responsive manner. It will be appreciated that this example can be particularly useful as an educational aid in encouraging children to read the printed matter displayed on the pages of the book or to listen to the story while observing the flashing light display created in response to the voice of the storyteller, or in response to sound chips specifically added to enhance the requirements of the story. In addition the pages or individual parts of the pages may be three-dimensional and movable.

In the example of Figure 32, a greetings card 87 is provided with a similar lighting system as in the examples of Figures 30 and 31, the picture on the front or inside of the card being decorated with the light source array 88. The purpose here is to heighten the pleasure afforded to the recipient of the card. The examples of 31 and 32 would employ similar flex circuits and thin batteries as in the example of Figure 30.

In all the examples of Figures 30 to 32, a small mechanical switch can be incorporated so as to energize the circuit in response to the opening of the record sleeve, story book or greetings card.

In the example of Figure 33, the invention is applied to a pet collar. The collar 89 is made from two thicknesses of appropriate material, such as leather or PVC folded at one end to fix the buckle 90. The material of the collar may have an inherent reflective quality or may have added a reflective surface characteristic. One thickness is formed with holes through which light sources such as light emitting diodes 91 can project. The collar carries on one face a housing 92 which contains a control circuit comprising, for example, a circuit board or chip, a battery, an on/off switch 93 and the microphone. Leads from the control circuit in the housing pass through the material along the collar between the two thicknesses to the respective sources. The LEDs spaced along the collar can be of various shapes, sizes and colours. The housing is made of durable material and carries a plate for name-address etc. The housing has a cover 94 with easy access to the battery and the name plate.

As sounds are detected the light sources (preferably LEDs) are energized forming light motion of multicoloured flashing lights. The unique safety feature is that the animal will have protection from traffic (moving traffic) due to its increased visibility, particularly at night. Also, the invention as applied in Figure 33 makes it readily possible to locate the whereabouts of the pet wearing the collar in the dark.

All of the illustrated embodiments utilise a sound-responsive control circuit for illuminating one or more light sources to advantageous effect while the energizing sound persists and in some cases for a predetermined delay thereafter.

CLAIMS

1. A sound responsive lighting system comprising:
a sound transducer;
at least one light source; and
control means coupled to control the energization of the light source in accordance with the sound detection by said sound transducer such that in the absence of sound having a predetermined acoustical characteristic said light source remains de-energized.

2. A lighting system according to claim 1 wherein said control means includes a threshold detector arranged to respond to the sound detected by said sound transducer reaching a threshold level to permit energization of the light source.

3. A lighting system according to claim 2 including means for adjusting said threshold level.

4. A lighting system according to claim 2 or claim 3 wherein said control means includes delay means for maintaining said light source energized for a predetermined period of time following the sound level falling below said threshold.

5. A lighting system according to any preceding claim wherein a plurality of said light sources is provided.

6. A lighting system according to claim 5 wherein said control means is arranged to cause said light sources to be activated in response to the sound detection by said sound transducer in accordance with a predetermined response programme.

7. A lighting system according to claim 6 wherein said control means is arranged to cause sequential energization of said light sources while the transducer continues to detect activating sound.

8. A lighting system according to claim 7 wherein said control means is operable to repeat a predetermined sequence of energization of said light sources in accordance with the continuation of said activating sound.

9. A lighting system according to claim 6 or claim 7 wherein said control means is so arranged as to cause the sequential energization of said light sources at a rate which is dependent upon the sound level detected by said transducer.

10. A lighting system according to any of claims 5 to 9 comprising a plurality of sets of said light sources, each said set being arranged to be

independently controlled by said control means in accordance with the sound detected by said transducer.

11. A lighting system according claim 10 when dependent upon claim 3, wherein said control means comprises a respective said threshold means for each said set of light sources whereby said sets can be caused to be activated in response to different sound levels.

12. A lighting system according to any preceding claim wherein the or each said light source comprises a light-emitting diode.

13. A lighting system according to any of claims 5 to 12 including light sources for emitting different coloured lights.

14. A lighting system according to any preceding claim which is arranged to be battery powered.

15. A lighting system according to any of claims 1 to 13 which is arranged to be powered from a mains power supply.

16. A cover member in or for an electrical switch, said cover member incorporating a lighting system according to any of claims 1 to 13, wherein a light source of said lighting system is arranged to emit light outwardly of the switch.

17. A timing device having a time display and incorporating a lighting system according to any of claims 1 to 13, a light source of said lighting system being arranged to illuminate said time display in response to sound.

18. A timing device according to claim 17 wherein said time display is an analog display, such as a circular clock face with rotary hands.

19. A timing device according to claim 17 wherein said time display is a digital display.

20. A timing device according to claim 18 or claim 19 in the form of a wrist watch.

21. A timing device according to claim 18 or claim 19 in the form of a free/standing clock.

22. A timing device according to claim 21 when dependent on claim 18 wherein said time display includes a time scale and a time indicator arranged to move along said scale and wherein a light source of said lighting system is provided at a predetermined position along said time scale, said timing device having means for producing sound at a predetermined time or times as indicated on the time display, said lighting system being adapted to respond to the sound produced by the timing device.

23. A locating device comprising a body, means for attaching said body at a required position, and a lighting system according to any of claims 1 to 13, a light source of said lighting system being arranged to emit light outwardly of the device.

24. A keyring having a member adapted for attachment to a key or keys and a tag, fob or other attachment incorporating a lighting system according to any of claims 1 to 13 with a light source thereof arranged to emit light outwardly of said attachment.

25. A lighter having a casing and flame-producing components and a lighting system according to any of claims 1 to 13 with at least one light source of the system carried in and arranged to emit light outwardly of said casing.

26. An article of clothing, jewellery or other personal adornment, such as a broach, pendent, mask, hat, shoe or gown incorporating a lighting system according to any of claims 1 to 13, a light source or sources of said lighting system being arranged to emit light outwardly of the article.

27. A musical instrument incorporating a lighting system according to any of claims 1 to 13 with a light source or light souces of said lighting system arranged to emit light outwardly of said musical instrument.

28. A hanging Christmas decoration comprising a shaped body portion, means by which the decoration can be suspended, and a lighting system according to any of claims 1 to 13 with a light source or light sources arranged to emit light outwardly of the decoration.

29. A record player comprising a base mounting a turntable and tone arm and a lid, and incorporating a lighting system according to any preceding claim with a light source or light sources of said lighting system arranged in a pattern to emit light outwardly of the record player.

30. A musical mobile comprising a support member by which the mobile may be mounted, and a plurality of figures rotatably suspended relative to said support, and incorporating a lighting system according to any of claims 1 to 13 with a light source or light sources of said lighting system being carried by a said figure, or said figures and arranged to emit light outwardly thereof.

31. A musical mobile according to claim 30 wherein said figures are suspended from a rotatable frame, and wherein there is provided drive means for rotating said frame, said control means being arranged to energize said drive means whenever the light source or sources are energized.

32. A musical box including means for playing a tune and incorporating a lighting system according to any of claims 1 to 13, with the light source or light sources of said lighting system arranged to emit light outwardly of the musical box.

33. A musical box according to claim 32 including a part which rotates while the music plays, and light source or light sources being carried on said moving part.

34. A portable radio having a casing and a lighting system according to any of claims 1 to 13 with a light source or light sources of said lighting system being arranged to emit light outwardly of said casing.

35. An article according to any of claims 32 to 34 wherein means is provided to enable the lighting system to operate independently of the operation of the musical box for the playing of the tune or of the radio for radio reception.

36. A kaleidoscope including a lighting system according to any of claims 1 to 13 and in which

light emitted by said light source or sources can be viewed after multiple reflection by a plurality of a mutually inclined reflective surfaces.

37. A kaleidoscope according to claim 36 wherein said housing includes forward and rear axially aligned and mutually rotatable casing portions and wherein said reflective surfaces are fixed within the forward casing part, an aperture being formed at the forward end of said forward casing part through which the multiple reflected light can be view, and wherein the light sources are arranged in a mutually fixed array carried within said rear casing portion so that by mutually rotating said forward and rear casing portions, light from different regions of said array of sources enters a reflective tunnel formed by said reflective surfaces.

38. A kaleidoscope according to claim 36 or claim 37 wherein there is provided optical refracting means positioned to refract and/or colour the light from said light source or light sources before such light is multiply reflected by said reflective surfaces.

39. A kaleidoscope according to any of claims 36 to 38 including optical transmission means for transmitting light from the said light source or light sources so as to produce from each such source a plurality of light images to be viewed after multiple reflection by said reflective surfaces.

40. A kaleidoscope according to any of claims 36 to 39 wherein there is provided light mass means having an array of optical windows and arranged to selectively mask the light from the light source or light sources from the reflective surfaces, the pattern of masking thereby being variable by relative rotation of said forward and rear casing portions.

41. A decorative panel having matter in pictorial, graphical or relief formed thereon, and incorporating a lighting system according to any of claims 5 13 with the light sources spaced about the panel and arranged to emit light to that side carrying said pictorial, graphical or relief matter.

42. A loudspeaker cover which comprises a decorative panel according to claim 41.

43. A loudspeaker cover according to claim 42 wherein the transducer is arranged to receive activating sound not only from that side which, in use, will lie adjacent to a loudspeaker, but also from the other side of the panel.

44. An article to be used in a throwing game, such as a throwing disc or ball, incorporating a lighting system according to any of claims 1 to 13 with the light source or light sources of the lighting system arranged to emit light outwardly of the article.

45. A protective cover for a gramaphone record or records carrying pictorial or graphic matter on an outer surface thereof and incorporating a lighting system according to any of claims 5 to 13 with the light sources of said lighting system positioned about said surface to decorate said matter.

46. A protective cover according to claim 45 formed from folded sheet material and comprising two mutually hinged positions, each said portion comprising two thicknesses of said sheet material, wherein said control means of said lighting system comprises a thin circuit disposed between the thicknesses of one of said parts.

47. A picture book comprising a plurality of pages of which at least one is decorated by light sources of a lighting system according to any of claims 5 to 13.

48. A greetings card of which at least one face is decorated by the light sources of a lighting system according to any of claims 5 to 13.

49. A protective cover, picture story book or greetings card according to any of claims 45 to 47 including switch means responsive to the opening of one portion of the article relative to the other to activate the lighting system to respond to sound.

50. A pet collar incorporating a lighting system according to any of claims 5 to 13, the light sources of said system being spaced along the collar and arranged to emit light outwardly thereof.

51. A lighting system as incorporated in a switch cover member substantially is herein before described with reference to Fig. 6 of the accompanying drawings.

52. A lighting system as incorporated in a wrist watch substantially as herein before described with reference to Fig. 7 of the accompanying drawings.

53. A lighting system as incorporated in a locating device substantially as hereinbefore described with reference to Fig. 8 of the accompanying drawings.

54. A lighting system as incorporated in a keyring substantially as hereinbefore described with reference to Fig. 9 of the accompanying drawings.

55. A lighting system as incorporated in a lighter substantially as hereinbefore described with reference to Fig. 10 of the accompanying drawings.

56. A lighting system as incorporated in an item of jewellery substantially as hereinbefore described with reference to Fig. 11 of the accompanying drawings.

57. A lighting system as incorporated in a mask substantially as hereinbefore described with reference to Fig. 12 of the accompanying drawings.

58. A lighting system as incorporated in an article of headwear substantially as hereinbefore described with reference to Fig. 13 of the accompanying drawings.

59. A lighting system as incorporated in a shoe substantially as hereinbefore described with reference to Fig. 14 of the accompanying drawings.

60. A lighting system as incorporated in an article of clothing substantially as hereinbefore described with reference to Fig. 13 of the accompanying drawings.

61. A lighting system as incorporated in a hanging decoration substantially as hereinbefore described with reference to Fig. 16 of the accompanying drawings.

62. A lighting system as incorporated in a child's watch substantially as hereinbefore described with reference to Fig. 17a of the accompanying drawings.

63. A lighting system as incorporated in an alarm clock substantially as hereinbefore described with reference to Fig. 17b of the accompanying drawings.

64. A lighting system as incorporated in record player substantially as hereinbefore described with reference to Fig. 17c of the accompanying drawings.

65. A lighting system as incorporated in a musical instrument substantially as hereinbefore described with reference to Fig. 18 of the accompanying drawings.

66. A lighting system as incorporated in a musical instrument substantially as hereinbefore described with reference to Fig. 19 of the accompanying drawings.

67. A lighting system as incorporated in a musical box substantially as hereinbefore described with reference to Fig. 20 of the accompanying drawings.

68. A lighting system as incorporated in a musical mobile substantially as hereinbefore described with reference to Fig. 21 of the accompanying drawings.

69. A lighting system as incorporated in a portable radio substantially as hereinbefore described with reference to Fig. 22 of the accompanying drawings.

70. A lighting system as incorporated in a kaleidoscope substantially as hereinbefore described with reference to Figs. 23 to 25 of the accompanying drawings.

71. A lighting system as incorporated in a kaleidoscope substantially as hereinbefore described with reference to Figs. 23 to 25 as modified by Fig. 26 of the accompanying drawings.

72. A lighting system as incorporated in a kaleidoscope substantially as hereinbefore described with reference to Figs. 23 to 25 as modified by Fig. 27 of the accompanying drawings.

73. A lighting system as incorporated in loudspeaker cover substantially as hereinbefore described with reference to Fig. 28 of the accompanying drawings.

74. A lighting system as incorporated in a protective cover for a gramaphone record substantially as hereinbefore described with reference to Fig. 30 of the accompanying drawings.

75. A lighting system as incorporated in a picture book substantially as hereinbefore described with reference to Fig. 31 of the accompanying drawings.

76. A lighting system as incorporated in a greetings card substantially as hereinbefore described with reference to Fig. 32 of the accompanying drawings.

77. A lighting system as incorporated in a pet collar substantially as hereinbefore described with reference to Fig. 33 of the accompanying drawings.

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